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**In re Application of**

HARAR

**Application Number**

07/337566

## Five

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## United States Patent [19]

Harari et al.

(11) Patent Number: 5,418,752

(45) Date of Patent: May 23, 1995

[54] FLASH EEPROM SYSTEM WITH ERASE SECTOR SELECT

[75] Inventors: Elyahon Harari, Los Gatos; Robert D. Norman, San Jose; Sanjay Mehrotra, Milpitas, all of Calif.

[73] Assignee: Sundisk Corporation, Santa Clara, Calif.

[21] Appl. No.: 963,851

[22] Filed: Oct. 20, 1992

## Related U.S. Application Data

[62] Division of Ser. No. 337,566, Apr. 13, 1989, abandoned.

[51] Int. Cl.<sup>6</sup> ..... G11C 7/00

[52] U.S. Cl. .... 365/218; 365/185; 365/900

[58] Field of Search ..... 365/185, 218, 900, 230.03

[56] References Cited

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system design", Computer Design, Mar. 1, 1989, pp. 30 and 32.

Primary Examiner—Joseph A. Popek  
Attorney, Agent or Firm—Majestic, Parsons, Siebert & Howe

## [57] ABSTRACT

A system of Flash EEPROM memory chips with controlling circuits such as non-volatile memory such as that provided by magnetic disk drives. Improvements include selective multiple sector erase, in which any combinations of Flash sectors may be erased together. Selective sectors among the selected combination may also be de-selected during the erase operation. Another improvement is the ability to remap and replace defective cells with substitute cells. The remapping is performed automatically as soon as a defective cell is detected. When the number of defects in a Flash sector becomes large, the whole sector is remapped. Yet another improvement is the use of a write cache to reduce the number of writes to the Flash EEPROM memory, thereby minimizing the stress to the device from undergoing too many write/erase cycling.

4 Claims, 5 Drawing Sheets

